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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/942,451	08/29/2001	Kenneth Andrew Dean	CR01-011	7925

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[REDACTED] EXAMINER

LEURIG, SHARLENE L

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 08/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Offic Action Summary</b>	Applicati n No.	Applicant(s)
	09/942,451	DEAN ET AL.
	Examiner Sharlene Leurig	Art Unit 2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 01 July 2003.
- 2a) This action is **FINAL**.                  2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) 20-39 is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-17 is/are rejected.
- 7) Claim(s) 18 and 19 is/are objected to.
- 8) Claim(s) 1-39 are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 29 August 2001 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on \_\_\_\_\_ is: a) approved b) disapproved by the Examiner.  
 If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

#### Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some \* c) None of:
1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
 a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

#### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 6) <input type="checkbox"/> Other: _____                                     |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of claims 1-19 in Paper No. 4 is acknowledged.
2. Claims 20-39 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected method claims, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 4.

### ***Drawings***

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: element 90, which is mentioned on page 25, line 21 and page 26, lines 5, 10, 16 and 18, is not included in any of the drawings. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claims 1 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim recites the limitation of a nano-supported

catalyst "having active catalytic particles that are less than about five hundred nanometers," but the claim fails to recite what dimension this measurement describes. For the purposes of examination, the claim will be interpreted as meaning that at least one dimension of the catalytic particles can be less than five hundred nanometers.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 4, 6-8, 12 and 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al. (6,514,113).

Regarding claim 1, Lee discloses a field emission device comprising a substrate such as glass (column 7, lines 55-57) that has a deformation temperature that is less than six hundred and fifty degrees Celsius (column 7, lines 63-65), a nano-supported catalyst formed on the substrate, the catalyst having active catalytic particles that are between 20 and 60 nanometers in size, and therefore can be less than five hundred nanometers in at least one dimension (column 7, lines 50-52), and at least one nanotube that is disposed on the nano-supported catalyst, the nanotube having a diameter of less than twenty nanometers, since Lee discloses that the nanotube can be

"several nanometers through several tens of nanometers" in diameter (column 3, line 46-48).

The Examiner notes that the claim limitation of the nanotube being obtained by means of a catalytic process *in situ* is drawn to a process of manufacturing, which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of a difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113).

Regarding claim 4, the Examiner notes that the claim limitation of the nanotube being obtained by means of a catalytic process *in situ* with hot filament chemical vapor deposition is drawn to a process of manufacturing, which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of a difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113).

Regarding claim 6, Lee discloses catalytic particles that are between 20 and 60 nanometers in size, and therefore can be less than fifty nanometers in at least one dimension (column 7, lines 50-52).

Regarding claim 7, Lee discloses a nanotube diameter of "several nanometers to several tens of nanometers", and therefore discloses a diameter of less than five nanometers, since several is taken to be more than two, but not very many (column 3, lines 46-48).

Regarding claim 8, Lee discloses a nanotube with a diameter of "several nanometers to several tens of nanometers" and a length of "several tens through several thousands of times longer than the diameter" (column 3, lines 45-50). Therefore the aspect ratio, which the applicant has defined in the specification as the ratio of length to width, fits within the claimed range of greater than 140 and less than 4500.

Regarding claim 12, Lee discloses a substrate made of glass (column 7, line 57) or silicon (column 10, lines 35-36).

Regarding claim 14, Lee discloses an anode (column 6, line 16).

Regarding claim 15, Lee discloses spacers (Figure 1, element 500) formed between the catalytic metal film (300) and the anode (700). The spacers can be as long as 700 microns (column 6, line 8). The layer 300 can be 2-200 nm (column 5, lines 36-38). The metal film 200 can be between 0.3 and 0.5 microns in width (column 5, lines 27-31). Therefore the distance between the anode and the bottom substrate can be greater than 250 microns and less than 5000 microns (700 microns + 0.5 microns + 200 nm = 700.7 microns).

Regarding claim 16, Lee discloses a thickness of the nano-supported catalyst that is between the range of 2 and 200 nanometers, and therefore less than one micron (column 5, lines 36-38).

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-7, 9-14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (5,872,422) (of record) in view of Lee et al. (6,514,113).

Regarding claim 1, Xu discloses a field emission device comprising a substrate (Figure 1, element 12) made of glass (column 6, lines 38-41) and a nano-supported catalyst formed on the substrate, the catalyst having active catalytic particles that are less than about five hundred nanometers in at least one dimension (column 8, lines 8-14). The smallest nanotube diameter disclosed by Xu is 20 nm (column 9, lines 44-48).

Xu lacks explicit disclosure of a substrate having a deformation temperature of less than 650 degrees Celsius. Xu further lacks explicit disclosure of a nanotube with a diameter of less than twenty nanometers. However, Xu discloses that the smaller the catalyst particles are, the smaller the nanotubes can be made to be, and discloses a preference for small-diameter nanotubes for greater emitter density that results in lower cost (column 5, lines 46-51).

Lee teaches a field emission device comprising a substrate such as glass (column 7, lines 55-57) having a common deformation temperature that is less than six hundred and fifty degrees Celsius (column 7, lines 63-65). Lee also teaches a nanotube having a diameter of less than twenty nanometers, since Lee discloses that the

nanotube can be “several nanometers through several tens of nanometers” in diameter (column 3, line 46-48). Lee teaches that such a small diameter results in “very high electron emission efficiency” (column 3, lines 51-54).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Xu’s field emission device with a glass substrate having a deformation temperature of less than 650 degrees Celsius in order to use a well-understood and readily-available material and to further modify Xu’s device with nanotubes having diameters of less than 20 nm in order to create a device with improved emission efficiency, as taught by Lee.

The Examiner notes that the claim limitation of the nanotube being obtained by means of a catalytic process *in situ* is drawn to a process of manufacturing, which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of a difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113).

Regarding claim 2, Xu discloses a switching voltage of less than eighty volts (column 16, lines 8-10).

Regarding claim 3, Xu discloses a current density of 1 A/cm<sup>2</sup> (column 20, line 14), which is within the claimed range of greater than 0.5 milliamp per squared centimeter.

Regarding claim 4, the Examiner notes that the claim limitation of the nanotube being obtained by means of a catalytic process *in situ* with hot filament chemical vapor

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deposition is drawn to a process of manufacturing, which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of a difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113).

Regarding claim 5, Xu discloses a switching voltage of less than fifty volts (column 16, lines 8-10).

Regarding claim 6, Xu discloses active catalytic particles that are thirty nanometers in diameter, and therefore within the claimed range of less than fifty nanometers in at least one dimension (column 8, lines 8-14).

Regarding claim 7, Xu lacks disclosure of nanotube diameter less than 20 nm. However, Xu discloses a preference for nanotubes with as small a diameter as possible in order to provide greater emitter density that results in lower cost (column 5, lines 46-51).

Lee teaches a nanotube diameter of “several nanometers to several tens of nanometers”, and therefore discloses a diameter of less than five nanometers, since several is taken to be more than two, but not very many (column 3, lines 46-48).

Therefore regarding claim 7, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Xu’s field emission device with nanotubes having diameters of less than 5 nm in order to create a device with improved emission efficiency, as taught by Lee.

Regarding claim 9, Xu discloses a single-walled nanotube (column 9, line 32).

Regarding claim 10, Xu discloses a multi-wall nanotube (column 9, line 32).

Regarding claim 11, Xu discloses a current density of 1 A/cm<sup>2</sup> (column 20, line 14), which is within the claimed range of greater than 1.5 milliamp per squared centimeter.

Regarding claim 12, Xu discloses a substrate comprising at least one material selected from the group consisting of glass, ceramics and metals (column 6, lines 38-41).

Regarding claim 13, Xu discloses a gate spacing of less than 5 microns, which is within the claimed range of less than 25 microns (column 21, lines 26-30).

Regarding claim 14, Xu discloses an anode (column 19, line 58).

Regarding claim 16, the thickness of the nano-supported catalyst is less than 1 micron (column 7, lines 64-67).

Regarding claim 17, the nano-supported catalyst is comprised of active catalytic particles selected from the group consisting of iron, nickel, cobalt (column 7, lines 38-40) and a metal oxide selected from the group consisting of alumina, silica, and magnesium oxide (column 7, lines 50-52).

#### ***Allowable Subject Matter***

10. Claims 18 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

The Examiner notes that the Prior Art of Record, Lee et al. (6,514,113), discloses a nano-supported catalyst comprising a porous layer resulting from the catalytic layer (Figure 1, element 300) being etched to separate the catalytic metal film into individual catalytic metal particles (column 5, lines 47-50). The catalytic metal film is disposed on another metal film layer (200) made of various metals, but not containing any catalytic particles (column 5, lines 26-32).

The Examiner notes that the Prior Art of Record, Xu et al. (5,872,422) (of record), discloses a nano-supported catalyst comprising a layer containing catalytic particles but lacks a non-porous sublayer containing catalytic particles.

The Examiner notes that the Prior Art of Record fails to teach or suggest the combination of limitations as set forth in claim 18, and specifically comprising the limitation of the nano-supported catalyst being comprised of a porous sublayer having active catalytic particles supported by a metal oxide structure and a non-porous sublayer having active catalytic particles and a structural metallic element.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharlene Leurig whose telephone number is (703)305-4745. The examiner can normally be reached on Monday through Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (703)305-4794. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7382 for regular communications and (703)308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Sharlene Leurig  
July 14, 2003



*Joseph Williams*  
*Joseph Williams*